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# The Use of Telegraphic Reading Material by Aphasic Patients

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AN ABSTRACT OF THE THESIS OF Sylvia Diane Tovey for the  
Master of Science in Speech Communication: Emphasis in  
Speech Pathology/Audiology presented May 16, 1977.

Title: The Use of Telegraphic Reading Material by  
Aphasic Patients

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The purpose of this study was to determine if aphasic patients have significantly more correct answers for telegraphically written material when compared to normally written material.

Twenty subjects from the greater Portland metropolitan area were selected to be included in this study. The ages of the subjects ranged from forty-two through sixty-five years with a mean of fifty-four years.

The test material consisted of two paragraphs controlled for fourth grade grammar and vocabulary and two paragraphs controlled for sixth grade grammar and vocabulary. A normally written and a telegraphically written paragraph were used for each of the four paragraphs for a total of eight test paragraphs.

The results of this study revealed no statistically significant difference for the magnitude of correct answers for the telegraphically written material; however, a significant number of subjects gave more correct answers for the telegraphic material at both the fourth and sixth grade levels.

These results demonstrate that it is easier for some aphasic patients to comprehend telegraphically written material than normally written material. Therefore, telegraphically written material may be of value for patients with aphasia who are relearning to read. This type of material may also be used for recreational reading when requested by aphasic patients.

THE USE OF TELEGRAPHIC READING  
MATERIAL BY APHASIC PATIENTS

by

SYLVIA DIANE TOVEY

A thesis submitted in partial fulfillment of the  
requirements for the degree of

MASTER OF SCIENCE  
in  
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Portland State Univeristy  
1977

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## TABLE OF CONTENTS

	PAGE
ACKNOWLEDGMENTS . . . . .	iii
LIST OF TABLES . . . . .	vi
LIST OF FIGURES . . . . .	viii

### CHAPTER

I	INTRODUCTION AND STATEMENT OF PURPOSE . . .	1
	Introduction . . . . .	1
	Statement of Purpose . . . . .	3
	Definition . . . . .	4
II	REVIEW OF THE LITERATURE . . . . .	5
	Background to Adult Aphasia . . . . .	5
	Language and Speech	
	Definitions of Aphasia	
	Etiology of Aphasia	
	Cerebral Dominance	
	Intellectual Functioning and	
	Language Problems in Aphasia	
	Early Remediation for Aphasia	
	Impairment of Reading in Adult Aphasic	
	Patients . . . . .	16
	Vocabulary Usage	
	Verbal Retention Span	
	Memory Span	
	Attention Span and Concentration	
	Effects of Fatigue on	
	Concentration	
	Anxiety Tensions	
	Visual Field Anomalies	
	Visual Discrimination	
	Alexia	
	Management Guidelines for	
	Reading	

CHAPTER		PAGE
III	TESTS AND PROCEDURES . . . . .	35
	Subjects . . . . .	35
	Pre-test Procedures . . . . .	37
	Questionnaire Screening Test	
	Reading Test . . . . .	40
	Test Formulation Test Design Administration	
	Data Analysis . . . . .	45
IV	RESULTS AND DISCUSSION . . . . .	47
	Results . . . . .	47
	Discussion . . . . .	57
V	SUMMARY AND IMPLICATIONS . . . . .	65
	Summary . . . . .	65
	Implications . . . . .	66
	Clinical Research	
	BIBLIOGRAPHY . . . . .	70
	APPENDICES	
A	READING HISTORY QUESTIONNAIRE . . . . .	75
B	SCREENING TEST . . . . .	76
C	TEST MATERIAL . . . . .	77
D	SUBJECTS' AGE, READING AND TEST PROFILES .	81



# LIST OF TABLES

TABLE		PAGE
I	Summary of Results of Subject Questionnaire . . . . .	38
II	Total Number Correct Responses at the Fourth Grade Level . . . . .	48
III	F Test, Analysis of Variance at the Fourth Grade Level . . . . .	50
IV	Wilcoxon T Ordinal-Rank Test on Normal and Telegraphic Language for Fourth Grade Material . . . . .	51
V	Total Number Correct Responses at the Sixth Grade Level . . . . .	52
VI	<u>t</u> Tests for Independent Means at the Sixth Grade Level . . . . .	54
VII	F Test, Analysis of Variance at the Sixth Grade Level . . . . .	55
VIII	Wilcoxon T Ordinal-Rank Test on Normal and Telegraphic Language for Sixth Grade Material . . . . .	56
IX	<u>t</u> Tests for Dependent Means Comparing Telegraphic and Normal Paragraphs . . .	58
X	Wilcoxon T Ordinal-Rank Test Comparing Fourth and Sixth Grade Material for Normal Paragraphs . . . . .	59

## TABLE

## PAGE

XI	Wilcoxon T Ordinal-Rank Test Comparing Fourth and Sixth Grade Material for Telegraphic Paragraphs . . . . .	60
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## LIST OF FIGURES

FIGURE		PAGE
1	Retina, Optic Radiation, and Hemisphere Functions in the Perception of the Visual Fields . . . . .	27
2	How a Sentence Is Perceived by Individuals with Either a Right or Left Visual Field Cut (Hemianopsia) . . . . .	28
3	Control of Presentation of Grammar Style . .	43
4	Design for Administration of Test Material . . . . .	43

## CHAPTER I

### INTRODUCTION AND STATEMENT OF PURPOSE

#### INTRODUCTION

Aphasia is an impairment in the use of language caused by injury to the dominant cerebral hemisphere of the brain (Taylor, 1958; Boone, 1965; Rusk, 1971; and Mossman, 1976). Aphasia is not attributable to neuromuscular impairment of the speech musculature, mental deficiency, psychopathology, or dysfunction of the peripheral sense organs (Rusk, 1971; and Mossman, 1976).

When aphasia is present, there is a deficit in both the input and output systems of language. Any, or all, of the following intellectual parameters may be affected: 1) comprehending the speech of others; 2) reading; 3) recognizing objects; 4) performing mathematical functions; 5) speaking; 6) writing; 7) spelling; 8) counting; and 9) telling time (Taylor, 1958; Boone, 1965; Rusk, 1971; and Mossman, 1976). In addition, there also may be a reduction in the available expressive vocabulary, dysfunction in the use of grammar, involvement of the verbal retention span, and confusion of letters as well as inability to use gestures, imitate movements, and pantomime appropriately (Rusk, 1971;

and Mossman, 1976.

The first priority in language training is re-establishing verbal comprehension and expression. It is essential the individual with aphasia develop these parameters of language so he will be able to express himself adequately and understand others when they speak to him.

Reading, writing, spelling, and mathematics are introduced into the training sessions as needed by the patient after verbal skills are well established (Eisenson, 1973). These "pencil and paper" tasks are taught in conjunction with verbal language expression and comprehension combined with speech remediation for apraxia or dysarthria, if present.

Reading is usually introduced initially through items necessary to every day living, such as the labels on food cans and street signs (Buck, 1968). Wepman (1951) and Buck (1968) recommend individual words be read first. These words then can be copied, read aloud, and used in talking after reading. After the individual masters these initial reading tasks, he progresses to whatever type of reading is important to him, e.g., newspapers, periodicals, or books.

When the aphasic patient first begins reading complete sentence and paragraph material, such as newspaper articles, he likely will have difficulty understanding what he is reading. This difficulty is caused by a combination of a short memory span, reduced vocabulary, visual problems, and a short attention span (Wepman, 1951; Berry and Eisen-

son, 1956; Agranowitz and McKeown, 1964; Smith and Philip-  
pus, 1969; Halpern, 1972; and Eisenson, 1973).

Buck (1975) instructs certain aphasic patients, who are beginning to read, to select visually the words in each sentence which contain the meaning of the sentence. This technique calls for visual input, decoding, and rating of each word as to whether it is important to the meaning of the sentence.

An alternative method for initial retraining in reading would be to use material which omits the words which are not necessary for understanding the meaning of the paragraph. With this type of material, the aphasic individual would not have to selectively retain or ignore words as he reads; all words in each sentence would be necessary for comprehension of that sentence. This type of reading material has been used by the author with aphasic patients. In some instances, improved comprehension was noted. Therefore, the author desired to verify the accuracy of this clinical observation under controlled research conditions.

#### STATEMENT OF PURPOSE

The purpose of this study was to determine if it was easier for the adult aphasic patient to read telegraphically written material and comprehend its meaning than it is to read and comprehend normally written material.

One hypothesis was tested:

Adult aphasic patients will provide significantly more correct answers for telegraphically written material at the fourth grade and sixth grade levels than for normally written material for each grade level.

In an effort to answer this hypothesis, these additional questions were asked:

- 1) Would there be a relationship between topics and the number of correct responses?
- 2) Would there be a relationship between grade level and the number of correct responses?
- 3) Would there be a relationship between latency of response and the number of correct answers?

#### DEFINITION

In this investigation "telegraphic writing style" is defined operationally as follows: material which is written in the telegraphic style has the parts of grammar omitted which are not essential to the understanding of the meaning of the sentence. These parts of grammar include auxiliary verbs, adjectives, adverbs, and articles (Harrison, 1947; McNeil, 1970; and Menyuk, 1971). An example of telegraphically written material is: "Cat climbed tree," instead of the normal writing style: "The cat climbed up the tree."

## CHAPTER II

### REVIEW OF THE LITERATURE

The present chapter will seek to bring together information from the literature dealing with adult aphasia on a two-fold basis: 1) background information based on clinical observations, experiences, and research that seek to describe the condition known as aphasia in adults; and 2) information related to the impairment of the reading process as observed in the adult patient with aphasia. Specifically, these kinds of data will be presented below under two major headings: 1) a background to adult aphasia; and 2) impairment of reading in adult aphasic patients.

### BACKGROUND TO ADULT APHASIA

#### Language and Speech

Language is the means by which humans communicate with one another. It is also the means by which each individual thinks, plans his actions, and is aware of what is transpiring in the world around him. Language is composed of symbols which are an arrangement of discernible stimuli (events) which are either audible and/or visible, and sometimes tactile (Eisenson, 1971a). Humans receive meaning from symbols by the association of a symbol with its corre-



sponding event. For example, an association is established between the symbol cat and the object (event), a small animal covered with fur, which meows and purrs. The process of symbol and object association starts during infancy and continues through the lifetime of the individual.

Language is the arrangement of symbols according to semantic and grammatical rules into a system employed for the purpose of communication (Perkins, 1971). The ability to use language is dependent on memory, i.e., the power of "reproducing and identifying what has been learned or experienced" (Penfield and Roberts, 1959). As an individual develops from a child into an adult, an ongoing process takes place in the brain--the growth of the language system. Penfield and Roberts (1959) hypothesize that language is based on: 1) a memory for concepts; 2) a memory for experiences; and 3) a memory for words. There is formed in the brain a ganglionic equivalent for a word (words) and a ganglionic equivalent for a concept (concepts) with experience, over the years, continuing to reinforce neuronal interrelationships between the two.

Speech is the oral communication medium of a linguistic code. Speech is the most widely employed of all language modalities and in some instances, such as illiteracy, it may be the only language system used by some individuals. Other language mediums are reading, writing, and gesturing. Specialized communication systems for visually and aurally handicapped individuals include braille and sign language

(Eisenson, 1971a).

### Definitions of Aphasia

Aphasia is a disorder reducing the use of language. The definition of aphasia differs according to whichever author is cited. McConnell (1974) stated aphasia is the inability to recognize the meaning of words. He said the aphasic patient will not be able to speak or write meaningfully. Schuell et al. (1964) and Schuell (1974) proposed the theory that aphasia is a general deficit that crosses all language modalities and may or may not be compounded by other sequelae of brain damage, such as reduction of available vocabulary, impaired verbal retention span, and impairment in the production of messages. Darley (1964) advanced the theory that aphasia is a symbolic communication disorder resulting from the impairment of some central, integrative process which makes possible the association of old, learned stimuli and new stimuli. There is an impairment of comprehension, formulation, and use of the human symbol system. Darley (1964) stated the aphasic impairment is not the result of mental defect, poor motor control, or the restriction of sensory input. Penfield and Roberts (1959) defined aphasia as a disturbance in speech, comprehension of speech, naming, reading, or writing. Any one or more of these language modalities may be disturbed. Penfield and Roberts (1959) agreed with Darley (1964) that aphasia is not the result of a disturbance of the mechanism of articulation

or involvement of the peripheral nerves, nor due to general mental insufficiency. Eisenson (1960, 1971a) stated aphasia is a subtractive disturbance of language with an impairment in the ability to deal with symbol activity and related areas. There is a reduced likelihood that the aphasic individual involved in a communication situation will understand the speech of others or be able to produce an appropriate verbal formulation.

All of these definitions have in common the concept that aphasia is an impairment in the use of language. Aphasia is characterized by an inability to receive and classify symbols and an inability to relate symbols to objects (Wood, 1960). The inability to comprehend language is often accompanied by an inability to formulate language. This disability not only involves verbal language but also generally affects the processes of reading and writing. Along with these disabilities, there is also a reduction in available vocabulary and a shortened verbal retention span (Schuell et al., 1964). Eisenson (1971a) noted the deaf aphasic patient may also be impaired in his ability to use language. This disability is caused by a deficit in the formulation and comprehension of visible signs, sign language.

The aphasic individual is impaired in the ability to use propositional speech. According to Eisenson (1971a), propositional speech is linguistic symbols used for the purpose of communication, and is unique for the speakers

and the situation. Automatic speech is generally preserved in the aphasic patient. This type of speech includes emotionally charged utterances, cliches, expletives, and verbal series, e.g., counting, reciting the alphabet, and social gestures. Automatic speech is triggered in a set formulation and does not require specific linguistic encoding which is necessary for propositional speech.

### Etiology of Aphasia

Aphasia is the result of brain injury which occurs in many ways. Cerebro-vascular accidents, the major etiology of aphasia in people of middle and old age, include thromboses, embolisms, aneurysms, hemorrhages, and ischemias, with embolisms, hemorrhages, and thromboses being the most common (Wepman, 1951; Halpern, 1972; and Eisenson, 1973).

Physical trauma to the brain, gun shot wounds, automobile accidents, and falls can cause aphasia as well as brain tumors and their extirpation, abscesses, infectious diseases, and degenerative diseases (Boone, 1965; Taylor and Warrington, 1971; Halpern, 1972; and Eisenson, 1973).

According to Shafer et al. (1974), the older patient, over sixty-five years of age, does not recover from the effects of a cerebro-vascular accident as well as younger patients. The older patient is prone to have pre-existing hypertension, arteriosclerosis, atherosclerosis, diabetes, prediabetes, or a combination of these disorders which inhibit, or destroy, collateral circulation and diminish the

recovery potential of the patient (Ullman, 1962; Sherman, 1964; Reitan, 1966; and Keenan and Brazzell, 1975). Rusk (1971), Zankel (1971), and Keenan and Brazzell (1975) stated the younger patient with external etiology may be expected to show more recovery from aphasia because of a lack of cardio-vascular disorders which inhibit recovery potential.

### Cerebral Dominance

Many studies have been conducted with the intent of establishing the dominant language hemisphere. There is general agreement that the left hemisphere of the brain controls speech and language for right handed individuals (Weinstein and Teuber, 1957; Luria, 1966a; and Goldberg and Schiffman, 1972). Eisenson (1971b), however, noted approximately ten percent of the right handed population may have language dominance controlled by the right hemisphere of the brain.

The controversy over brain dominance for language function occurs with regard to both the left handed and ambidextrous populations. Penfield and Roberts (1959) stated the left hemisphere is dominant for language in the left handed individual unless there has been an early trauma or congenital malformation in that hemisphere; then language dominance becomes the function of the right hemisphere. Wertz et al. (1977) reported on a case of congenital left hemisphere arteriovenous malformation in which the subject was left handed and right hemisphere dominant for language.

The results of this case history are in agreement with the theory of Penfield and Roberts (1959). Halpern (1972), after reviewing the literature, found it is not clear which hemisphere controls language in the left handed individual. Goldberg and Schiffman (1972) propose the figure of twenty-eight percent of the left handed population having language dominance in the right cerebral hemisphere. Eisenson's (1971b) empirical observation is that twenty to thirty percent of the left handed population has right hemisphere dominance for language.

Cerebral dominance for language for the ambidextrous individual is less clearly delineated than for the left handed individual as most of the literature reviewed by this author does not discuss the ambidextrous individual. Eisenson (1973) advanced the theory that this small group of people may have a more bilateral representation in the brain for language than the left handed population; however, he groups ambidextrous and left handed individuals together when considering aphasic disturbances.

#### Intellectual Functioning and Language Problems in Aphasia

No matter which hemisphere is dominant for speech and language, aphasia may occur when the dominant hemisphere is damaged. When aphasia is present, the patient presents a lower level of intellectual functioning than he possessed before the trauma occurred. Eisenson (1973) warns that the term intellectual functioning must be used instead of intel-

ligence to avoid the implication there is a nonreversible impairment of intelligence following brain damage. When an I.Q. test is administered to an aphasic patient, his Full Scale I.Q. score will be lower than it was before the trauma (Wepman, 1951). His Verbal I.Q. also will generally be lower than his Performance I.Q. (Weinstein and Teuber, 1957; Wood, 1960; and Matarazzo, 1972). Additionally, there generally will be a lower test score on the Wechsler Memory Scale which measures immediate and remote recall (Eisenson, 1960; and Matarazzo, 1972).

Matarazzo (1972) stated the following variables must be taken into account when considering the magnitude and effect of the brain damage and the test scores:

- 1) laterality of lesion (right or left hemisphere);
- 2) regional location or site of lesion within hemisphere;
- 3) causal agent(s) creating lesion(s);
- 4) age of patient when lesion was incurred;
- 5) time interval between damage and testing;
- 6) condition of the patient (e.g., drugs he might be taking, etc.) at time of assessment apart from brain damage;
- 7) lateral motor and higher cortical function dominance;
- 8) premorbid condition of patient; and
- 9) severity and extent of lesion.

When considering intelligence test scores of aphasic

patients, it is important to remember several factors. Some aphasic patients cannot deal with purely verbal tests since they have difficulty understanding the meaning of words and grammar (Luria, 1966a). There may be a rapid extinction of word traces which reduces comprehension. These patients may also have difficulty forming verbal responses to the test items (Luria, 1966a). All of these language deficits will lower the Verbal I.Q.

The test atmosphere may also influence test results. Wood (1960) noted aphasic patients perform poorly on timed tests. According to Eisenson (1973), anxiety caused by timed psychological evaluation causes a reduction in ideal testing conditions. The results obtained from timed tests may not reflect optimum intellectual functioning. According to a study by Luria (1966a), intelligence tests should be administered as untimed tests to obtain results as good as possible from the patient.

According to Wepman (1951), the purpose of intelligence testing with aphasic patients should be to determine the ability of the patients to respond to problems at that time. The nature of the aphasic individual's problem limits his response pattern, depending on the severity of the organic trauma. Wepman (1951) warned the examination may be measuring the aphasia rather than the intellectual functioning of the individual.

It is thought best that, whatever the results be, they should be considered as inferential only. Quantitatively they offer little or no valid information,



and even qualitatively they must be understood and used only in the light of the language handicap (Wepman, 1951).

Accompanying the lowered level of intellectual functioning is a regression to earlier developmental stages in the use of language (Wepman, 1951; and Parisi and Pizzamiglio, 1970). Using U.S. Army records, Wepman (1951) established a mean educational grade level of 9.85 years for his subjects prior to brain injury. After the trauma occurred, but before training proceeded, the mean educational grade level was 3.6 years; thus, there was a loss, on the average, of six grade levels in the aphasic individual.

According to a study by Keenan and Brazzell (1975), aphasic patients who had a good formal education, or who continued to read and write after finishing school, tend to lose their grasp of language to a lesser degree than individuals who were illiterate or did not continue to use language skills. Keenan and Brazzell (1975) hypothesize that the more literate person seemed to have language more deeply embedded in the central nervous system which aids in the recovery process.

#### Early Remediation for Aphasia

Language stimulation often is initiated while the aphasic patient is still in the hospital, as soon as he is aware of what is occurring around him (Wepman, 1951; Perkins, 1971; and Eisenson, 1973). An instance of this stimulation occurs when the patient uses nonverbal language

such as a grunt or gesture to request an object and someone verbally supplies the appropriate name when giving the patient what he desires, e.g., "Here's a shirt" (Smith, 1967; and Zankel, 1971). Pairing the verbal label with the object helps stimulate the use of language. Eisenson (1971c) stated language stimulation must begin as early as possible so the aphasic patient does not resort to habitual use of nonverbal communication or reconcile himself to not communicating with others and withdraw from social interaction.

Informal language retraining procedures continue to be used by the family when the aphasic patient returns home from the hospital (Buck, 1968). At home, the naming process should include items of clothing and household objects which can be seen, felt, or heard, such as chair, table, stove, and telephone. This type of language stimulation is similar to the process of language development of children, and is a necessary first step in the reacquisition of language usage (Wepman, 1951; and Buck, 1968).

Language training provided by a speech pathologist should begin while the patient is in the hospital. This service consists of support and reassurance for the aphasic patient and counseling for the family (Berry and Eisenson, 1956; Perkins, 1971; Halpern, 1972; and Buck, 1975). Formal testing and training sessions should be postponed until after the aphasic patient is neurologically stable, and has initiated physical mobility, continence, and eating skills (Wepman, 1953; and Buck, 1975). Two factors to consider

before beginning formal management sessions are psychological readiness and spontaneous recovery. Psychological readiness for therapy is necessary if the patient is going to progress. If the patient indicates he does not want to start therapy, he probably is not ready to benefit from formal remediation sessions (Taylor, 1958; and Smith, 1967).

Spontaneous recovery of language begins when edema caused by brain trauma begins to subside. With a decrease in edema, neurons surrounding the site of damage begin to reactivate and function or there may be an adaptive transfer of function to another area of the brain (Eisenson, 1973; and Mossman, 1976). Taylor (1958), Eisenson (1973), Keenan and Brazzell (1975), and Skelly (1975) recommended therapy be initiated during the first six weeks post-trauma to utilize spontaneous recovery. They state that therapy started during this time enhances the process of language recovery since the aphasic patient is generally receptive to external stimuli.

#### IMPAIRMENT OF READING IN ADULT APHASIC PATIENTS

As discussed above, reading is one of the language modalities used for the purpose of communication. When an individual reads, he is applying a broad set of linguistic skills to one language medium (Hartstein, 1971). Reading is based on the recognition of the meaning of individual words and sometimes entire phrases. When an individual begins to

read, he must perceive and analyze each letter, process letter groups into their corresponding phonetic structure, and then comprehend the meaning of what is written. With practice, reading becomes an automatic process which rarely employs analysis and synthesis of individual letters (Luria, 1966a).

According to Gardner et al. (1975), virtually all aphasic patients experience difficulty, to some degree, with oral reading, or reading comprehension. This difficulty may occur in relative isolation with other language modalities remaining intact. Conversely, in the case of transcortical aphasia, reading may be better preserved than other language skills (Gardner et al., 1975). Usually all areas of receptive and expressive language are disrupted to some extent.

The remainder of this chapter is devoted to a discussion of linguistic and nonlinguistic disturbances associated with aphasia and how these defects affect the ability of the aphasic patient to read.

### Vocabulary Usage

Vocabulary usage is one of the parameters of language which is affected by the aphasic disturbance. There is a reduction in the vocabulary used by the aphasic patient (Wint, 1967). The words that are retained are those that were learned first or those that were used most often (Schuell, 1974). When anomia is present, it is character-

ized by a loss of all but the most frequently used words (Halpern, 1972).

Eisenson (1954) stated the correct use of available vocabulary depends, to a degree, on the type of task required of the individual. It is easiest for the aphasic patient to name an object present in his environment. It is more difficult for him to name a picture of an object, and the most difficult task is for him to identify the object from a written representation, even if the word for the object is in the oral vocabulary of the subject. As illustrated by Eisenson (1954), the comprehension of visible symbols, reading, is more likely to present difficulties for the individual with aphasia than the comprehension and expression of oral language.

According to the empirical data of Schuell (1965), Shewan and Canter (1971), and Halpern (1972), errors in vocabulary increase as the general frequency of usage of the words decreases. For example, the word comb is less common than the word hand since comb occurs one time per 3,500 words compared to hand which occurs one time per 500 words (Thorndike, 1944). There is also a decrease in correct usage as the length of the word increases (Schuell, 1965; Shewan and Canter, 1971; and Halpern, 1972).

### Verbal Retention Span

A reduced verbal retention span, which is a frequent, well-recognized clinical phenomenon, will also affect the

ability of the aphasic individual to read and retain enough words to comprehend the meaning of a sentence or paragraph (Wepman, 1951; Schuell et al., 1964; Schuell, 1965; Brooks, 1975; and DeRenzi and Nichelli, 1975). Luria (1966b) defined the verbal retention span as the ability to perceive, retain, and reproduce a series of serially ordered acoustic or visual signals. When this process breaks down, the person may not be able to retain more than two to three words at a given time. The first or last word may be lost or the order of the message units may be altered (Schuell et al., 1964). Luria (1966b) illustrated this by giving a patient with aphasia the verbal series "house-cat-ball." The patient repeated this series as "house-ball-and something else." He had forgotten the order in which the series was presented. This breakdown in serial order retention also applies to numbers. Luria (1966b) dictated the number series "3-0-9-8-2" which the patient repeated as "3-0-8-2-9." When the patient repeated the series a second time, the order was "3-8-2-0-9." The patient was aware of his incorrect reproduction but was unable to correct his response.

Reduction of verbal retention span also affects the aphasic patient when material is presented visually. An aphasic patient may have difficulty reproducing a series of numbers when they are presented one at a time. This difficulty can be alleviated by presenting the visual series as a whole whereby the individual can recognize the pattern of the series (Luria, 1966b).

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A reduced verbal retention span affects all language modalities. The aphasic patient may not be able to retain enough serially ordered words to comprehend the speech of others. He loses his thought pattern when verbalizing. When the individual with aphasia reads, he may forget what was in previous sentences and paragraphs. Schuell et al. (1964) are of the opinion errors in reading reflect a reduction of available vocabulary; however, reading difficulties stem primarily from a reduced verbal retention span.

According to Schuell (1965), Shewan and Canter (1971), and DeRenzi and Nichelli (1975), it is easier for the aphasic individual to read and retain material from a sentence than it is for him to read and understand a paragraph. When reading a paragraph, an aphasic individual will lose the meaning because by the time he reads the last sentence he will have forgotten what he read in the previous sentences. His verbal retention span has been overloaded by trying to retain sufficient linguistic chunks to form meaningful relationships (Schuell, 1965; and Perkins, 1971). Farrell (1969) has described the reduction of verbal retention span which affected Patricia Neal after her cerebro-vascular accident and caused reading difficulties:

...she was wallowing in mid-paragraph now, ticking the words off with her fingers, piling them up in the air with no sense of where they were leading and little memory of where they had begun.

Schuell (1965) has allowed for a reduced verbal retention span in her test, the Minnesota Test for the Differen-

tial Diagnosis of Aphasia (MTDDA). In this test, there is a paragraph reading section which has a reduced sentence length and a simplified sentence structure. The vocabulary of the paragraph is described as an easy adult reading level. Schuell et al. (1964) rated the words in the paragraph as being at the fourth grade level. The test is not timed and the subject may reread the paragraph to find answers to the questions which follow the paragraph. The object of the sub-test is to measure the subject's ability to obtain meaning from the printed page.

#### Memory Span

The process of memory is a summation of the sequence of reception, registration, retention, and recall of stimuli (Mossman, 1976). The stimulus is received by the organism, dependent on the intactness of attention, receptive language function, and perceptual processes. Then the new stimulus is either registered or lost. If the stimulus is registered by the individual, it is retained in storage whereby it is organized with previous experience. Memory traces are recalled into consciousness by a voluntary effort or upon the provocation of an associated stimulus (Mossman, 1976).

Along with a reduced verbal retention span, the individual with aphasia may have defects of memory. Schuell et al. (1964) said the aphasic patient has not lost words and concepts stored in memory, but he has difficulty re-

trieving them. The memory defect is one of recall and is associated with an impaired verbal retention span.

Research by Levin et al. (1976) assessed the memory defects of twenty-four subjects with head injuries which caused neurological deficits, brain stem involvement, or aphasia. The test results ranged from severe memory defects to normal memory function with five aphasic subjects falling in the severe range and two aphasic subjects scoring in the normal range. Levin et al. (1976) found the time lapse, e.g., two months to a year, between the trauma and testing was not positively related to the performance of the subjects. The results indicated there was a disproportionate representation of aphasic disturbances among head injured patients with impairments of memory.

#### Attention Span and Concentration

Another aspect which affects the ability to read is a short attention span combined with concentration difficulties (Taylor, 1958; Hodgins, 1964; and Smith, 1967). According to Mossman (1976), for a person to have an attention span adequate to receive new information, he must be able to concentrate on a specific stimulus with freedom from distractions in the environment. Wepman (1951) hypothesized a short attention span and lack of concentration is due to the inability of the patient to integrate his thought processes and focus on the task at hand. The individual with aphasia must make an increased voluntary effort to

concentrate on what is happening at the present moment (Eisenson, 1954).

Wint's (1967) observation from his personal experience tends to support this view. He noted after his stroke and the onset of aphasia, he did not have the power of continuous concentration necessary for reading. When he concentrated on the beginning of a sentence, he was not able to gain information from the end of the sentence; when he concentrated on the end of the sentence, what he had read in the first part of the sentence eluded him.

#### Effects of Fatigue on Concentration

The increased concentration necessary to attend to written material may cause an increase in fatigability which is a concomitant factor in aphasia (Buck, 1975). Fatigue will impair the ability of the aphasic patient to concentrate and he will not be able to function anywhere near his potential (Eisenson, 1973). Longerich and Bordeaux (1954) and Ullman (1962) recommend management sessions be short enough to circumvent fatigue. They stated increased fatigue causes failure in language reacquisition and, over time, failure will impede progress in recovery from aphasia.

#### Anxiety Tensions

Another concomitant factor in aphasia is a high level of anxiety. According to Ullman (1962) and Keenan and Brazzell (1975), the aphasic patient may be highly anxious which is not compatible with the ability to use available

language skills.

Matarazzo (1972) discussed two types of anxiety: transient, situational (state) anxiety and chronic, enduring (trait) anxiety. Studies suggest state anxiety is related to a specific situation and can be measured by: 1) the subject's self-report on the Sarason Test Anxiety Questionnaire or the Zuckerman Affect Adjective Check List; 2) standardized experimenter-individual situational-behavioral approaches, e.g., threat of electrical shock, report of subject's inferior performance or inducing time pressure with a stop watch; or 3) a combination of two or more of the anxiety measures. Matarazzo (1972) found state anxiety can be varied by a high- or low-pressure environment and negative or positive instructions and comments given by the clinician.

Trait anxiety does not vary with the situation, but is reasonably stable within the individual. The only time trait anxiety varies is in the presence of situational stress (Matarazzo, 1972). Wint (1967) reported a constant state of trait anxiety after his stroke. He said his anxiety was caused by his inability to perform at pre-trauma levels and his knowledge of his inadequacy.

When working with the aphasic patient, the clinician should be aware of both state anxiety and trait anxiety. The patient may be in a constant state of chronic, trait anxiety caused by apprehensiveness about his present condition compared to his pre-trauma capabilities and misgivings

about his ability to improve (Wepman, 1951). Trait anxiety can be increased by situational anxiety during management sessions when the patient tries to read at levels incompatible with his present functional language skills.

The clinician can reduce situational anxiety by providing success during each management session. Day-to-day success will reduce anxiety; then the patient will be more able to attend to details and appreciate his own progress (Wepman, 1951).

#### Visual Field Anomalies

Visual field defects may also cause difficulty for the individual with aphasia (Darley, 1964; and Schuell et al. 1964). Visual acuity must be tested and corrective lenses prescribed if necessary; however, the defects associated with brain trauma are those of the visual field (Buck, 1968). The most common visual field defect is some degree of hemianopsia which is a partial or complete loss of one-half of the visual field. The lesion which causes hemianopsia and other visual field defects may occur in the eye which receives the stimulus, the optic radiation which transmits the stimulus, or the visual cortex which appreciates the stimulus (Wepman, 1951; Luria, 1966a; and Mossman, 1967).

The laterality of the visual field cut refers to the side of the affect vision. A right visual field cut implies imperfect vision to the right sides of the patient's

visual fields in both eyes; a left visual field cut implies imperfect vision to the left sides of the patient's visual fields in both eyes. A field cut on either side may be partial or complete. Homonymous hemianopsia indicates the visual field defect is identical within the corresponding visual fields of both eyes (Buck, 1968 and Mossman, 1976). (See Figure 1.)

If an individual has blindness of the left visual fields, he will not begin reading at the left margin of the page but will begin in the middle of the page. With right visual field blindness, the patient will start reading at the left margin and infer the content of the right sides of the page. (See Figure 2.)

According to Mossman (1976), patients with a right visual field deficit are more likely to compensate for their defect while reading than those with a left visual field deficit. According to Luria (1966a), a left visual field cut is often accompanied by agnosognosia which is a lack of awareness or denial of illness or disability. Aphasic patients with agnosognosia fail to recognize or do not correctly interpret sensory stimuli (Darley, 1964). The aphasic patient with left visual field hemianopsia generally cannot appreciate his visual disability and compensate for it (Luria, 1966a). Therefore, Mossman (1976) recommended drawing a colored line down each margin of the page the aphasic patient will be reading. The patient is then instructed to read from the left colored line until he reaches

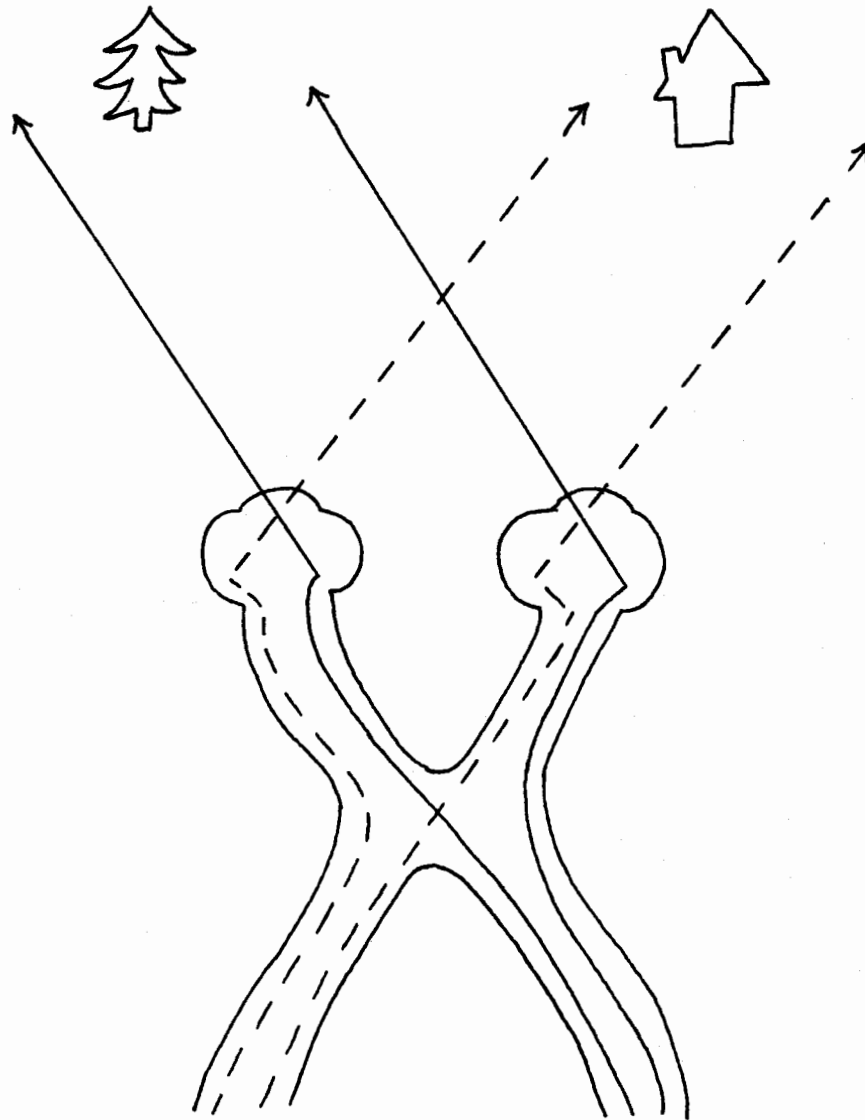


Figure 1. The tree in the left visual field is perceived by the nasal (medial) retina of the left eye and the temporal (lateral) retina of the right eye. The fibers from the nasal retinas decussate at the optic chiasm such that the perception of the left field of vision becomes a right hemisphere function and vice versa (Mossman, 1976).



WE LIVE NORTH OF TOWN

A person with a right visual field cut will perceive the above sentence as:

WE LIVE NORTH

A person with a left visual field cut will perceive the above sentence as:

NORTH OF TOWN

or:

TOWN

Figure 2. How a sentence is perceived by individuals with either a right or left visual field cut (hemianopsia) (Mossman, 1976).

the right line. This external reminder should be used when reading therapy begins, if the patient does not compensate for his visual field defect. The colored lines can be omitted when the patient learns to compensate for his deficit.

Other visual field defects may also be caused by lesions on the eye, optic radiation, or visual cortex. Scotoma is a dark spot on the visual field. The dark area may occur in the middle of the visual field or may be a dark zone surrounding the center of the visual field (Gould, 1936). Obfuscation (cloudiness), or diplopia (double vision) may be present or blurring or intermittent crowding of words within the range of the visual field (Schuell, 1965, 1974; Smith, 1967; Buck, 1968, 1975; Farrell, 1969; Poppel and Shattuck, 1974). All of these visual problems will also interfere with the ability to read.

Poppel and Shattuck (1974) conducted research using twelve subjects with visual field defects (hemianopsia, complete quadrantanopsia, absolute or relative scotoma) and ten control subjects with no visual field defects. The results indicated that the subjects with visual field defects took twice as long to read the test material as the normal controls. Poppel and Shattuck (1974) concluded that lesions of the central visual pathways appear to produce slowing down in the processing of information.

### Visual Discrimination

Disturbances of visual discrimination or recognition

of visual symbols may be experienced by the patient with aphasia. When the impairment is severe, the individual may be unable to discriminate one letter from another (Schuell, 1974). With a milder impairment, the aphasic patient may have difficulty discriminating between the upper case letters EF, WM, CG, OQ, and the lower case letters pdbg, tf, hn, ur, wm, and mn (Schuell, 1965). Impaired discrimination may also extend to words. The individual may read match as watch, dark as park, store as stone, and horse as house.

According to a long-term study by Schuell (1974), in some instances when an aphasic patient has disturbed visual discrimination, he will have to decipher each letter individually and spell the word before he can recognize it. If this disorder is combined with a reduced verbal retention span, the patient may forget part of the word while spelling it. As a result, he will make more mistakes on long words than short ones (Schuell, 1974).

### Alexia

Alexia, or acquired dyslexia, is a disturbance in the evaluation and comprehension of written symbols when presented only through the visual modality (Longerich and Bordeaux, 1954; and Hartstein, 1971). This disorder, in the context considered here, is a result of the brain injury and did not exist in the individual prior to the trauma (Wepman, 1951; and Hartstein, 1971). Alexia is possibly related to an inability to revisualize or reauditorize the symbol. Thus,

the visual symbol is not retained for a sufficient period of time for a symbol-object association to be established (Wood, 1960). Alexia will cause reading disabilities, but other parameters of language will not be affected by this disorder (Woods and Poppel, 1974).

According to Luria (1966a,b), alexia consists of two types: alexia caused by lesions to the occipital cortex (optic alexia) and alexia which is the off-shoot of aphasia. Optic alexia is divided into literal and verbal alexia. When an aphasic patient has literal alexia, he is unable to perceive individual letters and their cue value. With literal alexia, letters lose their meaning. Patients with verbal alexia can recognize individual letters but cannot grasp the meaning of whole words. Words must be put together letter by letter before the individual can obtain meaning from them. Even familiar words, such as the aphasic patient's name, must be deciphered on an individual letter basis before meaning can be derived.

Luria (1966a) regarded alexia which accompanies temporal lesion aphasia as being of two types: alexia accompanying sensory aphasia and alexia accompanying motor aphasia. When sensory aphasia is present, the individual with alexia can easily perceive and recognize the meaning of well established words; however, he is unable to read them aloud. He also cannot read individual segments or letters composing words. The individual with sensory aphasia is hampered in the process of phonetic and literal analysis of words. This

person is deprived of the support of phonetic analysis and cannot read unfamiliar words.

The individual with motor aphasia will present symptoms of a different type of alexia (Luria, 1966a). As with sensory aphasia, the person with motor aphasia may be able to recognize well known words; however, he will make errors of letter substitutions, e.g., *m* for *b* and *l* for *t*. He may not be able to put letters into syllables and will read individual letters instead of syllables. The person with this type of alexia cannot perform the process of kinetic synthesis (putting letters into one smooth unit). In other words, the analytic-synthetic process of reading has been severely deranged (Luria, 1966b).

The aphasic patient with alexia will have difficulty with the short words in sentences, e.g., articles, prepositions, conjunctions. He will not be able to understand the semantic relationship between these classes of grammar and other words in the sentence (Eisenson, 1973). The alexic disturbance is generally compounded by a disturbance in visual discrimination and often by an impairment of the visual field (Schuell et al., 1964).

Alexia occurs when the individual reads material silently (Eisenson, 1973). Sasanuma (1974) found this difficulty can be circumvented by having the individual read aloud. Then the material is presented through the auditory channel through which the individual may comprehend the meaning.

Eisenson (1954) in Examining for Aphasia and Schuell (1965) in the MTDDA have constructed their tests to allow the clinician to learn if alexia is present. Sections of their tests require silent reading and other sections allow the aphasic individual to read the material both visually and aloud. The scores for silent reading and reading aloud are compared. If the score is poorer for silent reading, it is probable the individual has alexia.

Woods and Poppel (1974), through tests with a patient with alexia and aphasia, found intensification of the visual stimulus will help overcome the alexic disturbance and increase reading performance. The standard size of book print is from 1/16 to 1/8 inch. Taylor (1958) and Eisenson (1971a, 1973) recommend that print size be increased to at least twice the normal size, e.g., 1/4 inch. Increased print size will not only facilitate reading performance but will also reduce the length of time needed to respond to the material (Woods and Poppel, 1974).

#### Management Guidelines for Reading

Eisenson (1973) gave the following guidelines to be used with the aphasic patient when reading disabilities are present:

- 1) begin word at the patient's level of ability;
- 2) build up sight identification of words, phrases, and short sentences;
- 3) use the sound-out (phonic) approach for words

that are not easily read, providing that the patient has no dysarthria or inclination to paraphasic errors, or evidence of auditory aphasia;

- 4) comprehension rather than oral style is the objective; therefore, check comprehension by eliciting an oral or written response from the patient;
- 5) secure interesting reading material at the patient's level of competence;
- 6) upgrade the level of material as the patient progresses; and
- 7) make reading materials available that may be read by the patient solely for enjoyment and which will not become the content for instruction.

Eisenson (1973) cautioned the clinician to remember a reading deficit does not occur in isolation. The aphasic patient will have a combination of a few or many of the language and nonlinguistic disabilities considered in this chapter. These disorders can reduce the functional language level over all language modalities, including reading.

### CHAPTER III

#### TESTS AND PROCEDURES

#### SUBJECTS

This investigation involved twenty subjects selected from these sources: Rehabilitation Institute of Oregon, Portland Center for Hearing and Speech, Visiting Nurse Association, The Stroke Club, and U.S. Veterans Administration Hospital, Portland, Oregon. All of the subjects had had a cerebro-vascular accident. Brain trauma patients were not used as subjects since, according to Berry and Eisenson (1956), their reacquisition of language skills is generally different than for patients who sustained a cerebro-vascular accident. Each person had been evaluated by a speech pathologist as having an aphasic disorder. The age range of the subjects was forty-two through sixty-five years, with a mean age of fifty-four years. Six of the subjects were females (30 percent); fourteen were males (70 percent). All of the subjects were native speakers of English who came from families where English was the language spoken in the home during their childhood. Every subject was at least three months post-trauma.

The examiner inquired if the subjects used glasses for reading. Seven subjects were instructed to wear their



glasses during the screening and testing procedures to ensure they could see the material accurately and avoid fatigue caused by trying to concentrate on written material when visual acuity was not adequate to complete the task (Buck, 1975). Two prospective subjects with visual field defects, one who said she had a black ring around the center of her field of vision (scotoma) and one who said he saw double images (diplopia), were excluded from the study (Wepman, 1951; and Eisenson, 1973).

One subject selected for the investigation was under medication for the control of epileptic seizures which had occurred prior to the time of the study. The subject did not have a seizure within the week prior to the date set for the test; therefore, the testing procedure was not delayed (Young, 1951).

One potential subject had a pre-existing psychiatric disorder at the time of the cerebro-vascular accident which was reported by her physician. This individual was not used in the study because the psychiatric disorder could possibly compound the aphasic disturbance (Eisenson, 1960).

One potential subject experienced three transient ischemic attacks within one week prior to the testing date. This subject's physician reported he was not neurologically stable; therefore, he was not used in the study.

## PRE-TEST PROCEDURES

Questionnaire

A questionnaire was completed by the subject, his spouse, or the person who knew the most about the subject's reading preferences prior to the brain trauma. The results of this inquiry are detailed in Table 1. A subject was not excluded from the study if he or his spouse reported he did not engage in recreational reading prior to the brain trauma since this questionnaire was used for background information.

Screening Test

The screening test, which was administered to those subjects who were not excluded from the study during the medical prescreening, consisted of two parts. (See Appendix B for exact test material.)

Words. The first part of the screening test consisted of words printed on cards with letters one-quarter inch high, the same size as the print used for the test material (Eisenson, 1973). The words were selected after meeting three criteria:

- 1) They were in the highest frequency of usage according to Thorndike and Lorge (1944). All of the words fell in the 1 to 500 frequency of usage category.
- 2) They were words which were in fourth grade spelling books currently in use in Portland Public Schools (Portland Public Schools, 1967a; and Kottmeyer and Claus, 1972a).
- 3) The words were present either on the subject,

TABLE I

SUMMARY OF RESULTS OF  
SUBJECT QUESTIONNAIRE

Subject	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Pre-trauma difficulty with reading		x																		
Hours per week read prior to the stroke	0	0	14	5	14	14	14	10	6½	2	16	7	10	16	8	14	14	10	10½	12
Type of reading:																				
Newspapers			x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
Magazines			x	x	x	x	x	x	x		x	x	x	x	x	x			x	x
Fiction (novels)			x			x	x	x	x		x	x	x	x	x			x	x	x
Technical journals					x		x				x	x	x		x		x			
Did he enjoy reading (n=no, y=yes)	n	n	y	n	y	y	y	y	y	n	y	y	y	y	n	y	y	y	y	y
Hours per week reads now	0*	0*	0*	0*	1-2	0*	0	0*	0*	0*	1	3½	0*	3½	0	2	0	0*	0*	0
Only in therapy	x		x																	
TV Guide		x							x											
Practical purposes				x																
Beginning						x												x		
Newspaper								x		x	x	x	x			x			x	
Magazines														x						

\*Total reading time less than one hour per week.

e.g., body parts, or in the environment of the test room.

The subject was instructed to name each word or to point to an object in the room which corresponded to the test word. The examiner scored each response either correct or incorrect. Four or more errors out of a total of six responses eliminated the subject from further testing since this number of errors indicated the subject was unable to comprehend the material. Two subjects made more than four errors and were not used in the study.

If a subject stated he could not see the words clearly or that they were blurred or distorted, the test was discontinued and the subject was not included in the study. Two prospective subjects were excluded from the study because they reported visual field defects.

Sentences. Section Two of the screening test was composed of seven simple interrogative and command sentences. No compound or complex sentences were included. The vocabulary in this section was also at the fourth grade level (Portland Public Schools, 1967a; and Kottmeyer and Claus, 1972a).

The first four sentences required a yes/no answer which could be given verbally, could be marked on the test sheet, or could be pointed to for the examiner to underline. The remaining three sentences required a physical gesture from the subject.

Each sentence was scored either correct or incorrect.

If the subject missed two or more of the yes/no questions and more than one of the command (gesture) sentences, he was eliminated from the study. If a subject missed all of the interrogative sentences or all of the command sentences, he was also eliminated from the study. Two prospective subjects missed two of the questions and one of the command sentences. An additional subject missed all three of the command sentences. These three individuals were not included in the study.

## READING TEST

### Test Formulation

The reading test consisted of two paragraphs using fourth grade vocabulary and sentence structure and two paragraphs using sixth grade vocabulary and sentence structure (Wepman, 1951; Gilmore, 1952; Portland Public Schools, 1967a,b; and Kottmeyer and Claus, 1972a,b). Each of the paragraphs at the fourth and sixth grade levels was written in both the normal and telegraphic styles. (See Appendix C.)

The reading tests were written following the criteria used by Gilmore (1952). The paragraphs were controlled for:

- 1) grade level of vocabulary: Tests 4-A and B used fourth grade vocabulary and Tests 6-A and B used sixth grade vocabulary (Portland Public Schools, 1967a,b; and Kottmeyer and Claus, 1972a,b);
- 2) number of words per sentence: Test 4-A had an average of 11 words per sentence, Test

4-B had an average of 10 words per sentence, Test 6-A had an average of 15 words per sentence, and Test 6-B had an average of 13 words per sentence (Gilmore, 1952);

- 3) number of words per paragraph: Test 4-A had 68 words per paragraph, Test 4-B had 62 words per paragraph, both Tests 6-A and B had 103 words per paragraph (Gilmore, 1952);
- 4) multisyllabic words per paragraph: Test 4-A had 21 multisyllabic words per paragraph, Test 4-B had 20 multisyllabic words per paragraph, both Tests 6-A and B had 36 multisyllabic words per paragraph (Gilmore, 1952); and
- 5) percent of multisyllabic words per paragraph: Test 4-A had 30% multisyllabic words per paragraph, Test 4-B had 33% multisyllabic words per paragraph, both Tests 6-A and B had 35% multisyllabic words per paragraph (Gilmore, 1952).

After the test material was telegraphed, there were the following number of words and sentences per paragraph:

- 1) Test 4-A: an average of 8 words per sentence and 47 total words in the paragraph;
- 2) Test 4-B: an average of 7 words per sentence and 43 total words in the paragraph;
- 3) Test 6-A: an average of 12 words per sentence and 75 total words in the paragraph; and
- 4) Test 6-B: an average of 9 words per sentence and 75 total words in the paragraph.

The test questions were written using vocabulary commensurate with the tests, e.g., questions for Tests 4-A and B used fourth grade vocabulary and questions for Tests 6-A and B used sixth grade vocabulary (Portland Public Schools, 1967a,b; and Kottmeyer and Claus, 1972a,b). The word order of the test questions followed Scargill (1954) and Schuell (1965) with the verb first in the question to elicit a

"yes" or "no" response.

### Test Design

Each subject, because of intra-individual differences caused by the aphasic disturbance, was his own control and, therefore, was observed under both normal (N) and telegraphic (T) conditions. An equal number of subjects experienced the N and T treatment condition in the first testing position at both the fourth and sixth grade levels. Figure 3 illustrates how the order of presentation of grammar style was achieved by assigning one-fourth of the subjects to one of four treatment orders. All fourth grade material was presented prior to all sixth grade material for each subject.

The influence of the N and T grammar styles was assessed without being contaminated by the influence of the stimulus material (topics). To achieve this result, four topics were used, two at the fourth grade level (Tests 4-A and B) and two at the sixth grade level (Tests 6-A and B). Normal and telegraphic grammar styles were written for each of the four topics (a total of eight paragraphs as seen in Appendix C). In summary, each subject received N and T grammar style tests at both the fourth and sixth grade levels, for a total of four test paragraphs per subject.

Order effect of topics was controlled by presenting Topic 4-A before Topic 4-B and Topic 6-A before Topic 6-B.

The design represented in Figure 4 controls order

Figure 3

CONTROL OF PRESENTATION  
OF GRAMMAR STYLE

	FOURTH GRADE MATERIAL		SIXTH GRADE MATERIAL	
	TEST A	TEST B	TEST A	TEST B
GROUP 1	N*	T	N	T
GROUP 2	T**	N	N	T
GROUP 3	N	T	T	N
GROUP 4	T	N	T	N

Figure 4

DESIGN FOR ADMINISTRATION  
OF TEST MATERIAL

	FOURTH GRADE MATERIAL		SIXTH GRADE MATERIAL	
	TEST A	TEST B	TEST A	TEST B
GROUP 1 (n=5)	N <sub>A</sub> *	T <sub>B</sub>	N <sub>A</sub>	T <sub>B</sub>
GROUP 2 (n=5)	T <sub>A</sub> **	N <sub>B</sub>	N <sub>B</sub>	T <sub>A</sub>
GROUP 3 (n=5)	N <sub>B</sub>	T <sub>A</sub>	T <sub>A</sub>	N <sub>B</sub>
GROUP 4 (n=5)	T <sub>B</sub>	N <sub>A</sub>	T <sub>B</sub>	N <sub>A</sub>

\*N = normal

\*\*T = telegraphic



effects of grammar style, topic effects, order effects of topics, and precedence of fourth grade materials before sixth grade materials.

### Administration

Fifty percent of the tests were administered in the homes of the subjects, the other fifty percent were administered in a clinical setting. The rooms used for the tests were as free as possible from distractions.

No testing session lasted longer than thirty minutes. Fourteen subjects received both the screening test and experimental test in one session. The screening test and the test material were administered in multiple sessions for six subjects so they were not fatigued by the presentation of too much material at one time (Wepman, 1951, 1953; Long-erich and Bordeaux, 1954; and Taylor, 1958). Five of these subjects received the material in two sessions with a twenty-four hour interval between sessions. One subject received the material in three sessions with a twenty-four hour break between the first two sessions and a three hour interval between the second and third test times.

The sessions were conducted during the time of day preferred by each subject. Fifty percent of the subjects received the test material during the morning and fifty percent received it in the afternoon.

The verbal instructions given by the investigator to the subjects were:

Read this paragraph, then read the questions and mark the right answer. You may have as much time as you like. Go back and look for the right answer if you are not sure (Schuell, 1965).

The questions following each paragraph required a "yes" or "no" response. The subject answered either by checking his answer, pointing to the answer, or giving a verbal answer. If the subject responded verbally or pointed to the answer, the examiner marked the subject's response.

The criteria for failure of comprehension for the fourth grade material was set at four or more incorrect answers out of a maximum of six possible answers. Subjects 3, 17, and 20 missed four, five, and four answers respectively and were not given the sixth grade material.

#### DATA ANALYSIS

Data relative to the correctness of response of subjects were analyzed as follows: 1) effects of issues and grammar style on correct responses (magnitude) was assessed by a two-by-two repeated measures analysis of variance for fourth grade material; 2) for sixth grade material two t tests of independent means were performed, one on each grammar style treatment, to ascertain if there was a statistically significant difference between the two topics. This was not done on a two-by-two analysis of variance design (as with fourth grade level analysis) due to the loss of three subjects' responses, resulting in an unequal number

of subjects for topics at the sixth grade level. Subsequent to this, a single factor repeated measures analysis of variance was employed to assess grammar style effects on the sixth grade level material.

Because of the potential application, heretofore unexamined, of the telegraphic grammar style in this study, it was desirable to perform additional data analysis using a statistic that is maximally sensitive to the number of individuals producing treatment difference scores of a large magnitude and in the same direction. Four Wilcoxon T Ordinal-Rank tests were performed:

- 1) for normal versus telegraphic performance at the fourth grade level material;
- 2) for normal versus telegraphic performance at the sixth grade level material;
- 3) for fourth versus sixth grade levels with normal style; and
- 4) for fourth versus sixth grade levels with telegraphic style.

Finally, a Pearson  $r$  was computed to assess the relationship, if any, between response time and total correct scores for all subjects.

## CHAPTER IV

### RESULTS AND DISCUSSION

#### RESULTS

The hypothesis under investigation was: Adult aphasic patients will provide significantly more correct answers for telegraphically written material at the fourth grade and sixth grade levels than for normally written material for each grade level. Twenty subjects were used for the study. The original procedure was for each subject to be given both a normal and a telegraphically written paragraph for the fourth and sixth grade levels for a total of four paragraphs for each subject. The subjects were instructed to read each paragraph and answer six questions following it. Three subjects failed one paragraph each at the fourth grade level and did not receive the sixth grade material. Because of the unequal number of subjects for the fourth and sixth grade levels, different statistical designs were used to analyze the results at each grade level. Therefore, each grade level will be discussed separately.

Table II presents the total number of correct responses for each subject at the fourth grade level for both normal and telegraphic material. Seventy percent of the subjects averaged above the mean of 8.85 correct answers.

TABLE II

TOTAL NUMBER CORRECT RESPONSES

AT THE FOURTH GRADE LEVEL

SUBJECT	TEST 4-A		TEST 4-B		TOTAL
	NORMAL	TELEGRAPHIC	NORMAL	TELEGRAPHIC	
1		3	5		8
2		4	4		8
3		3	2		5
4		4	5		9
5		5	6		11
6	5			6	11
7	5			5	10
8	5			4	9
9	4			3	7
10		5	5		10
11	5			5	10
12	6			3	9
13	5			6	11
14	5			5	10
15	5			4	9
16		4	5		9
17		1	3		4
18	4			6	10
19		6	6		12
20		3	2		5

$$\bar{X}=8.85$$

One subject had twelve correct answers, three subjects had eleven, five subjects had ten correct answers, and five subjects had nine correct answers for a total of fourteen subjects with total correct answers above the mean.

F tests for two-way repeated measures analysis of variance analyzing the effects of grammar style and topics on the correctness of response were performed on the fourth grade material. (See Table III.) The F value for topics was .74 (nonsignificant) and the F value for grammar style was .01 (nonsignificant,  $p > .05$ ). The F value for interaction of grammar style and topics was 3.43 (nonsignificant,  $p > .05$ ).

A one-tailed Wilcoxon T Ordinal-Rank test was utilized to assess the number of subjects who had more correct responses for the telegraphic material for Topics 4-A and B when compared to Topics 4-A and B normal. (See Table IV.) The T was 2.43 ( $p < .025$ ) which shows more correct answers per subject for the telegraphic material for both topics.

The range of responses for subjects at the sixth grade level was from five to twelve correct answers. (See Table V.) Seventy-six percent of the subjects averaged above the mean of 8.0 correct responses. Three subjects had twelve correct answers, one had eleven, four had ten correct answers, and five had nine correct answers for a total of thirteen subjects with total correct answers above the mean.

Since three subjects failed one test each at the

TABLE III

F TEST, ANALYSIS OF VARIANCE  
AT THE FOURTH GRADE LEVEL

Source of variation	ss	df	MS	F
<u>Between subjects</u>	<u>416.89</u>	<u>39</u>		
A (topics)	.12	1	.12	.01*
Subjects within groups	416.77	38	10.97	
<u>Within subjects</u>	<u>34.50</u>	<u>40</u>		
B (grammar style)	.61	1	.61	.74*
AB	2.81	1	2.81	3.43*
B x subjects within groups	31.08	38	.82	

nonsignificant, \* $p > .05$ ; d.f.=1, 38

TABLE IV  
WILCOXON T ORDINAL-RANK TEST ON  
NORMAL AND TELEGRAPHIC LANGUAGE  
FOR FOURTH GRADE MATERIAL

TOPICS 4-A AND 4-B				
Normal	Telegraphic	d	Rank of d	Less frequent sign
5	3	2	12	
4	4	0		
2	3	-1	-5.5	-5.5
5	4	1	5.5	
6	5	1	5.5	
5	6	-1	-5.5	-5.5
5	5	0		
5	4	1	5.5	
4	3	1	5.5	
5	5	0		
5	5	0		
6	3	3	14	
5	6	-1	-5.5	-5.5
5	5	0		
5	4	1	5.5	
5	4	1	5.5	
3	1	2	12	
4	6	-2	-12	-12
6	6	0		
2	3	-1	-5.5	
				<hr/> 34
				T=2.43*

\*p < .025



TABLE V

TOTAL NUMBER CORRECT RESPONSES  
AT THE SIXTH GRADE LEVEL

SUBJECT	TEST 6-A		TEST 6-B		TOTAL
	NORMAL	TELEGRAPHIC	NORMAL	TELEGRAPHIC	
1	5			4	9
2	4			2	6
3*	-			-	-
4		5	3		8
5	6			6	12
6		6	6		12
7		5	4		9
8	4			6	10
9		4	2		6
10		5	5		10
11		5	5		10
12	4			4	8
13		4	5		9
14		4	5		9
15	5			6	11
16	4			5	9
17*		-	-		-
18	5			5	10
19		6	6		12
20*		-	-		-

\*did not take sixth grade material

$\bar{X}=8.0$

fourth grade level and consequently did not receive the sixth grade material, the total number of subjects for the sixth grade material was seventeen. This caused an unequal number of subjects for each cell of the two-way repeated measures design creating difficulties with analysis of variance. Therefore, two  $t$  tests for independent means and a one-way repeated measures analysis of variance were used for the sixth grade material.

Two  $t$  tests for independent means were applied to assess the effect of grammar styles on correctness of response. (See Table VI.) A  $t$  of .13 (nonsignificant) was obtained for Topics 6-A and B normal and a  $t$  of .18 (nonsignificant) was obtained for Topics 6-A and B telegraphic ( $p > .05$ ).

An F test of variance was performed to ascertain the significance of telegraphic versus normal grammar style. (See Table VII.) An F of .72 (nonsignificant) was obtained ( $p > .05$ ).

A one-tailed Wilcoxon T Ordinal-Rank test was utilized to assess the number of subjects who had more correct responses for the telegraphic material for Topics 6-A and B compared to Topics 6-A and B normal. (See Table VIII.) The T was 1.90 ( $p < .025$ ) which shows more correct answers per subject for the telegraphic material for both topics.

A Pearson Product Moment Correlation was performed to determine if a relationship existed between latency of response and total correct answers. An  $r$  of  $-.002$  (nonsig-

TABLE VI

t TESTS FOR INDEPENDENT MEANS

AT THE SIXTH GRADE LEVEL

NORMAL			
	MEAN	S.D.	<u>t</u> VALUE
GROUP 1	4.55	.72	.13*
GROUP 2	4.62	1.40	
d.f.=15			
TELEGRAPHIC			
	MEAN	S.D.	<u>t</u> VALUE
GROUP 1	4.87	.83	.18*
GROUP 2	4.77	1.30	
d.f.=15			

\*nonsignificant,  $p > .05$

TABLE VII  
F TEST, ANALYSIS OF VARIANCE  
AT THE SIXTH GRADE LEVEL

Source of variation	ss	df	MS	F
Between subjects	26.06	16		
Within subjects	11.00	17		
Grammar style	.47	1	.47	.72*
Res.	10.53	16	.65	
Total	37.06			

\*nonsignificant,  $p > .05$ , d.f.=1, 16

TABLE VIII  
WILCOXON T ORDINAL-RANK TEST ON  
NORMAL AND TELEGRAPHIC LANGUAGE  
FOR SIXTH GRADE MATERIAL

TOPICS 6-A AND 6-B				
Normal	Telegraphic	d	Rank of d	Less frequent sign
5	4	1	3.5	3.5
4	2	2	8.5	8.5
3	5	-2	-8.5	
6	6	0		
6	6	0		
4	5	-1	-3.5	
4	6	-2	-8.5	
2	4	-2	-8.5	
5	5	0		
5	5	0		
4	4	0		
5	4	1	3.5	3.5
5	4	1	3.5	3.5
5	6	-1	-3.5	
4	5	-1	-3.5	
5	5	0		
6	6	0		
				19.0
				T=1.9*

\*p < .025

nificant,  $p > .05$ ) was obtained.

For additional information, this investigator compared all fourth grade material (normal and telegraphic) with all sixth grade material (normal and telegraphic) to determine if there was a significant difference in correctness of response at either grade level. Two  $t$  tests of dependent means were performed. (See Table IX.) The  $t$  for fourth grade normal and sixth grade normal was .27 (nonsignificant) and the  $t$  for fourth grade telegraphic and sixth grade telegraphic was .29 (nonsignificant,  $p > .05$ ). A Wilcoxon T for fourth grade normal and sixth grade normal was .89 ( $p < .025$ ) and a T for fourth grade telegraphic and sixth grade telegraphic was 2.77 ( $p < .025$ ) showing a bias toward correctness of response at the sixth grade level for both normal and telegraphic material. (See Tables X and XI.)

#### DISCUSSION

The purpose of this investigation was to compare normal and telegraphic writing styles among adult patients with aphasia. The F tests and  $t$  tests, which are sensitive to the magnitude of response, revealed no significant statistical difference between the two writing styles. Wilcoxon T tests indicated a greater number of subjects gave more correct responses for the telegraphic grammar style than for the normally written material.

TABLE IX

t TESTS FOR DEPENDENT MEANS  
 COMPARING TELEGRAPHIC AND  
 NORMAL PARAGRAPHS

NORMAL			
	MEAN	S.D.	<u>t</u> VALUE
Grade 4	4.72	.82	.27*
Grade 6	4.55	.72	
d.f.=15			
TELEGRAPHIC			
	MEAN	S.D.	<u>t</u> VALUE
Grade 4	4.58	1.06	.29*
Grade 6	4.82	1.07	
d.f.=15			

\*nonsignificant,  $p > .05$

TABLE X

WILCOXON T ORDINAL-RANK TEST COMPARING  
FOURTH AND SIXTH GRADE MATERIAL  
FOR NORMAL PARAGRAPHS

Grade 4	Grade 6	d	Rank of d	Less frequent sign
5	5	0		
5	4	1	4	
5	6	-1	-4	-4
4	4	0		
5	4	1	4	
6	4	2	8.5	
5	5	0		
5	4	1	4	
5	5	0		
4	3	1	4	
5	6	-1	-4	-4
4	2	2	8.5	
5	5	0		
6	5	1	4	
5	5	0		
5	5	0		
6	6	0		
				<hr/>
				8
				T=.89*

\*p < .025



TABLE XI  
WILCOXON T ORDINAL-RANK TEST COMPARING  
FOURTH AND SIXTH GRADE MATERIAL  
FOR TELEGRAPHIC PARAGRAPHS

Grade 4	Grade 6	d	Rank of d	Less frequent sign
3	5	-2	-6.5	-6.5
6	2	4	11	
4	4	0		
5	5	0		
5	5	0		
4	4	0		
6	4	2	6.5	
6	6	0		
5	4	1	2.5	
4	2	2	6.5	
3	6	-3	-9.5	-9.5
5	5	0		
3	6	-3	-9.5	-9.5
6	4	2	6.5	
5	6	-1	-2.5	-2.5
4	5	-1	-2.5	-2.5
6	5	1	2.5	
				30.5
				T=2.77*

\*p < .025

These results demonstrate that it is easier for some aphasic patients to comprehend telegraphically written material than normally written material. Therefore, telegraphically written material may be of value for patients with aphasia who are relearning to read. This type of material may also be used for recreational reading when requested by aphasic patients.

Seventy-five percent of the subjects reported they enjoyed reading prior to their cerebro-vascular accident. The range of correct scores for these subjects was from four to twenty-four correct responses, with a mean of 16.73. Twenty-five percent of the subjects reported they did not enjoy reading before their trauma. The range for this group was fourteen to twenty correct answers ( $\bar{X}=17.40$ ). Whether or not the subjects enjoyed reading activities prior to their brain trauma does not seem to have influenced their post-trauma comprehension of material; however, to more accurately assess this variable a comparable number of readers and nonreaders would be required as subjects.

Keenan and Brazzell (1975) hypothesized individuals who continued to use reading and writing skills and those persons with the most formal education would be more likely to retain intellectual functions post-trauma. The range of reading time, pre-trauma, for those subjects above the mean of 9.85 hours was from ten to sixteen hours per week. The total correct answers for this group ranged from four to twenty-three ( $\bar{X}=17.0$ ).

The range of education above the mean of 12.9 years was 13.5 to 16 years. The range of correct responses for this group was from four to twenty-three answers ( $\bar{X}=15.88$ ); therefore a correlation between education and correctness of comprehension did not exist for this group. The results of this study do not support the hypothesis of Keenan and Brazzell (1975); however, the sample in this study was not large enough or well enough controlled for education and pre-trauma reading time to either prove or disprove their theory.

Five of the subjects indicated they engage in reading activities at the present time. The range of hours per week is from one to three and one-half hours. These subjects scored from seventeen to twenty-three correct responses around their mean of 19.40, compared to a total group mean of 16.90. All five individuals reported they enjoyed reading before their trauma. The mean test time for these subjects was 18.40 minutes, well below the group mean of 31.10 minutes but within one standard deviation below the group mean. The education of this group was 13.3 years, slightly above the total subject mean of 12.9 years.

Two theories may account for the performances of these five subjects. It may be that the brain damage sustained was less severe than for the total group, or the damage may possibly have occurred on a site in the brain which did not severely affect comprehension of language. If the damage was not severe, intellectual functioning and

educational level may not be as depressed as for the total group (Wepman, 1951; and Matarazzo, 1972). Also, verbal retention span and memory may not be as greatly reduced (Schuell, 1964; and Mossman, 1976). The second theory is that these subjects may have made a fuller recovery from the aphasia with a greater return in intellectual functioning for all language parameters, including reading. With a greater recovery in reading skills, these subjects may not have experienced as much situational anxiety as the rest of the group when they were exposed to written material; therefore the scores of these five subjects were higher (Matarazzo, 1972).

There were a greater number of incorrect answers for test questions: a) 4-A, No. 6; b) 6-A, No 6; and c) 6-B, No.6. These questions were:

4-A, No. 6: Should you plant flowers in front of windows?

6-A, No. 6: Will rockets carry astronauts?

6-B, No. 6: Should families drive the car when going camping?

These questions could be answered in either of two ways: 1) from reading the test paragraph; or 2) from everyday knowledge and experience. The high ratio of incorrect answers may have been caused by the subjects responding to these questions from their own personal experience.

Three possible explanations for this test anomaly are: 1) either the subjects had not retained the adminis-

trator's instructions and were not responding to the test material; 2) the subjects' verbal retention spans were not of sufficient length to retain all the information; or 3) the subjects were experiencing fatigue by the time they reached the sixth question and were not able to respond appropriately. The way to ascertain which of these explanations might be true would be to change the order of the test questions, i.e., put these three questions in either the Number 1 or Number 2 position. Then if these questions were answered correctly, fatigue or a reduced verbal retention span could be considered as contributing factors for the present preponderance of incorrect answers.

Over seventy-five percent of the subjects responded favorably to the increased print size of the test material. They commented the large print size made it easier for them to read the paragraphs.

The subjects also responded favorably to the vocabulary of the test paragraphs. Subject No. 6 said she is beginning to learn to read in therapy. She also tries to read the newspaper. This subject said she could read and understand the test paragraphs much easier than either the therapy material or the newspaper. Other subjects made similar comments about the vocabulary to this investigator.

## CHAPTER V

### SUMMARY AND IMPLICATIONS

#### SUMMARY

The purpose of this study was to determine if aphasic patients would have significantly more correct answers for telegraphically written material when compared to normally written material.

Twenty subjects from the greater Portland metropolitan area were selected to be included in this study. The ages of the subjects ranged from forty-two through sixty-five years with a mean of fifty-four years.

The test material consisted of two paragraphs controlled for fourth grade grammar and vocabulary and two paragraphs controlled for sixth grade grammar and vocabulary. A normally written and a telegraphically written paragraph were used for each of the four paragraphs for a total of eight test paragraphs.

The results of this study revealed no statistically significant difference for the magnitude of correct answers for the telegraphically written material; however, a significant number of subjects gave more correct answers for the telegraphic material at both the fourth and sixth grade levels.

These results demonstrate that it is easier for some aphasic patients to comprehend telegraphically written material than normally written material. Therefore, telegraphically written material may be of value for patients with aphasia who are relearning to read. This type of material may also be used for recreational reading when requested by aphasic patients.

### IMPLICATIONS

#### Clinical

The subjects responded favorably to both the large print size and the controlled vocabulary levels. These two items could be incorporated into materials for management sessions to aid in the reacquisition of reading skills for patients with aphasia.

#### Research

This investigator suggests further research be conducted with regard to the use of telegraphically written material with aphasic patients. One research project could consist of aphasic patients who were avid readers prior to their brain trauma. These subjects would be individuals who report they miss reading for enjoyment since their cerebro-vascular accident. A comparison could be made with this population and a control group of aphasic patients who did not read pre-trauma and did not miss this activity.

A comparison could be made between subjects with pos-

terior brain lesions and those with anterior damage. This information would have to be clearly delineated in a neurological report. If there is anterior brain damage, it may be associated with agrammatism (Wepman, 1951; and Eisenson, 1973). When agrammatism is present, verbal expression is characterized by the omission of functional words and speech is telegraphic. It may be this type of subject would be more comfortable with the telegraphically written tests and score higher on them. More research needs to be done in this area to determine if there could be a correlation between telegraphic speech and correctness of response on telegraphically written material.

Verbal retention span and memory could be tested by having two groups of subjects. The investigator would read the material to the first group. The second group would read each paragraph one time and not be allowed to refer back to it. The two groups could be compared for total number of correct answers comparing normal and telegraphic writing styles.

The Wilcoxon T test results which revealed the subjects gave more correct answers for all sixth grade material than for the fourth grade material raise more questions than there are answers for at the present time. Theories which could account for this effect are: 1) the large print size recommended by Eisenson (1973) and Sasanuma (1974) could reduce fatigue, and 2) the subjects were more comfortable with the test material and the administrator by the .



time they read the sixth grade material.

Questions for further research which apply to this test result include: 1) was there a learning effect taking place, 2) could aphasic patients be subject to less fatigue than is presently thought to be the case, and 3) do aphasic patients adapt to new material faster than the literature suggests (Eisenson, 1973)? All of these theories and questions will have to be investigated further before any conclusions can be made.

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## APPENDIX A

### READING HISTORY QUESTIONNAIRE

\_\_\_\_\_  
Name

1. Did he have any difficulty with reading prior to his present hospitalization? \_\_\_\_\_  
yes/no
2. Average number of hours per week he read prior to his present hospitalization \_\_\_\_\_.
3. What type of material did he read?
  - a. newspapers
  - b. magazines
  - c. fiction (novels)
  - d. technical journals and magazines
4. Did he enjoy reading? \_\_\_\_\_  
yes/no
5. Average number of hours per week he reads now \_\_\_\_\_.

### RELEASE OF INFORMATION

I give my consent to use information gained from this evaluation for thesis and research publication purposes.

\_\_\_\_\_  
Name

\_\_\_\_\_  
Address

\_\_\_\_\_  
Phone number

\_\_\_\_\_  
Date



## APPENDIX B

### SCREENING TEST

#### Words:

- |          |          |
|----------|----------|
| 1. ear   | 5. hand  |
| 2. table | 6. hair  |
| 3. door  | 7. floor |
| 4. book  | 8. head  |

#### Question sentences:

- |                                |     |    |
|--------------------------------|-----|----|
| 1. Is it raining today?        | yes | no |
| 2. Is my wife waiting?         | yes | no |
| 3. Is the coffee on the table? | yes | no |
| 4. Is my car outside?          | yes | no |

#### Command sentences:

1. Put your hand on the table.
2. Count to five.
3. Pick up the pencil.

## APPENDIX C

### TEST MATERIAL

#### Grade 4-A (Normal)

You can use some easy tricks to keep your house cooler this summer. Do not use your oven for cooking any more than necessary. Open your windows at night to let cooler air into the house. Close the windows in the morning to keep the house cool longer. Pull curtains over windows to keep sunlight out. Trees planted in front of windows will provide shade from the sun.

Are there ways you can keep your house cooler?	yes	no
Should you use your oven only when necessary?	yes	no
Should you close windows at night?	yes	no
Should you close windows during the day?	yes	no
Should you open curtains during the day?	yes	no
Should you plant flowers in front of windows?	yes	no

#### Grade 4-A (Telegraphic)

You can use tricks to keep house cooler this summer. Do not use oven more than necessary. Opening windows at night lets cooler air in house. Closing windows in morning keeps house cool. Pulling curtains over windows keeps sunlight out. Trees planted in front of windows provide shade.

Are there ways you can keep your house cooler?	yes	no
Should you use your oven only when necessary?	yes	no
Should you close windows at night?	yes	no
Should you close windows during the day?	yes	no
Should you open curtains during the day?	yes	no
Should you plant flowers in front of windows?	yes	no

## Test 4-B (Normal)

The common cold is very unpleasant. Colds occur more often in the winter than in the summer. Women catch more colds than men. People who smoke do not have more colds than other people. Parents of young children have more colds than other people because children bring home "cold bugs" from school. We contract colds from others when they cough or sneeze.

Is a cold unpleasant?	yes	no
Do colds occur more often in the summer?	yes	no
Do men have more colds than women?	yes	no
Do people who smoke have more colds?	yes	no
Do parents of young children have more colds?	yes	no
Do we catch colds when people sneeze?	yes	no

## Test 4-B (Telegraphic)

The common cold is unpleasant. Colds occur more often in the winter. Women catch more colds. People who smoke do not have more colds. Parents of young children have more colds than other people. We contract colds when others cough or sneeze.

Is a cold unpleasant?	yes	no
Do colds occur more often in the summer?	yes	no
Do men have more colds than women?	yes	no
Do people who smoke have more colds?	yes	no
Do parents of young children have more colds?	yes	no
Do we catch colds when people sneeze?	yes	no

## Test 6-A (Normal)

In the future, space exploration in our solar system will focus on the planets Mars and Jupiter. Scientists do not know if there is life on the planet Mars and exploration will finally give us an answer. A camera in a spaceship will take pictures of the planet and send them back to Earth. Scientists will examine the pictures and then the question of life on Mars will be solved. The planet Jupiter, which is similar to Earth, will also be explored for life. The rockets used for planet exploration will not carry astronauts. The reason is to avoid carrying human germs to the planet's environment.

Will space exploration focus on Saturn?	yes	no
Do scientists know if there is life on Mars?	yes	no
Will a camera take pictures of Mars?	yes	no
Will scientists examine the pictures?	yes	no
Will Jupiter be explored for life?	yes	no
Will rockets carry astronauts?	yes	no

## Test 6-A (Telegraphic)

In the future, space exploration will focus on Mars and Jupiter. Scientists do not know if there is life on Mars and exploration will give an answer. A camera will take pictures of the planet and send them to Earth. Scientists will examine the pictures and solve the question of life on Mars. Jupiter will also be explored for life. Rockets used for exploration will not carry astronauts to avoid carrying germs to the planets.

Will space exploration focus on Saturn?	yes	no
Do scientists know if there is life on Mars?	yes	no
Will a camera take pictures of Mars?	yes	no
Will scientists examine the pictures?	yes	no
Will Jupiter be explored for life?	yes	no
Will rockets carry astronauts?	yes	no

## Test 6-B (Normal)

Gasoline prices have risen to an all time high today. If people can discover ways to save gasoline, they will also save money. When driving to the store for groceries, invite a neighbor or friend to go shopping with you. Pick up another guest when you are going to a party. Taking only one automobile saves gasoline and also prevents engine wear. Whenever possible, do not drive your car but ride a city bus instead. Children should walk or ride bicycles instead of being driven around by parents. Families can ride bicycles when going on overnight camping trips instead of using the car.

Are gasoline prices low today?	yes	no
Will people save money if they save gasoline?	yes	no
Should you take a neighbor shopping to save gasoline?	yes	no
Should you take a bus instead of using your car?	yes	no
Should children ride in cars instead of walking?	yes	no
Should families drive the car when going camping?	yes	no

## Test 6-B (Telegraphic)

Gasoline prices have risen to all time high. If people can save gasoline, they will also save money. When driving to store for groceries, invite neighbor or friend to go with you. Pick up another guest when going to party. Taking one automobile saves gasoline and prevents engine wear. Whenever possible, do not drive but ride a bus. Children should walk or ride bicycles. Families can ride bicycles when going camping instead of using the car.

Are gasoline prices low today?	yes	no
Will people save money if they save gasoline?	yes	no
Should you take a neighbor shopping to save gasoline?	yes	no
Should you take a bus instead of using your car?	yes	no
Should children ride in cars instead of walking?	yes	no
Should families drive the car when going camping?	yes	no

# APPENDIX D

## SUBJECTS' AGE, READING

## AND TEST PROFILES

Subject	Age	Educa- tion	Enjoy Reading Prior?	Weekly Hours Read		Test Reading Time*	Total Correct Answers
				Prior	Post		
1	54	12.5	no	0	0	45	17
2	52	10	no	0	0	60	14
3	59	14	yes	14	0	60	5
4	55	12	no	5	0	40	17
5	42	15	yes	14	1-2	20	23
6	60	15	yes	14	0	80	23
7	57	12	yes	14	0	30	19
8	50	12.75	yes	10	0	25	21
9	47	14	yes	6.5	0	20	13
10	61	12	no	2	0	35	19
11	65	12	yes	16	1	20	20
12	47	13.5	yes	7	3.5	30	17
13	54	13	yes	10	0	20	20
14	60	12	yes	16	3.5	15	19
15	54	16	no	8	0	25	20
16	65	14	yes	14	2	7	18
17	51	14	yes	14	0	15	4
18	46	12	yes	10	0	25	20
19	47	12	yes	10.5	0	30	24
20	51	12	yes	12	0	20	5

\*minutes